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RESPONSES TO COMMENTS MEMORANDUM REGARDING DRAFT WORK PLAN, PRELIMINARY ASSESSMENT AND POTENTIAL RELEASE OF PER AND POLYFLUOROALKYL SUBSTANCES MCB QUANTICO VA

05/11/2018

CH2M HILL

Responses to Comments
Draft Work Plan, Preliminary Assessment, Potential Release of Per- and Polyfluoroalkyl Substances (PFAS)
Marine Corps Base Quantico, Quantico, Virginia

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On behalf of Naval Facilities Engineering Command (NAVFAC) Washington, please find below, responses to comments received on the *Draft Work Plan, Preliminary Assessment, Potential Release of Per- and Polyfluoroalkyl Substances (PFAS), Marine Corps Base Quantico, Quantico, Virginia* (CH2M HILL, March 2018).

The document was submitted for review on March 5, 2018. VDEQ submitted a no comment letter on March 23, 2018. EPA submitted the comments listed below on April 20, 2018; responses are presented with each comment below.

Comments Received from EPA Region 3:

Comment #1: Section 4. Preliminary Assessment Activities. Section 4.1.1 Data Reports. This section includes ecological habitats, floodplains and wetlands, that will be identified, up to one mile from the Base boundary. PFAS compounds are highly mobile and can travel great distances. Site-related PFAS compounds may be found further off-Site, and downgradient ecological receptors may have already been exposed.

Response: Comment noted. Navy policy currently recommends PFAS PA areas of interest be limited to 1 mile from the facility boundary; however, transport pathways to greater distances will be considered should a release at the site be identified, which may result in expansion of this boundary. Additionally, as per Table 5-1, surface water bodies (15 miles downstream) will be identified in the PA. Ecological receptors will be considered if it is determined that the site will move forward to a Site Investigation.

Comment #2: Figure 4-1. The FBI Aviation area is depicted but does not appear to be an Area of Interest. Please clarify.

Response: The FBI Aviation area was included in Table 4-2 as the FBI Aviation Team. For clarification, the text will be updated to FBI Aviation Area.

Comment #3: Site 22 (APS-02A) – Previous Burn Pits. The document states that the Site 22 (APS-02A) – Previous Burn Pits will not be included in the investigation due to the time of the activities at the pits. It is stated that this decision is based on the dates of use of the Site for fire training activities during the years from 1953 – 1962. Because the use of AFFF began prior to the 1950's (e.g., manufacturing started in 1947 by 3M Company), this Site should be considered as part of the Work Plan. Please provide information that determined water was used to extinguish fires.

Response: Based on the information obtained from the 3M website (accessed February 9, 2018 and provided as Attachment 1), 3M researchers met with scientists from the U.S. Naval Research Laboratory about the potential of developing firefighting foams to suppress fires involving aviation fuel and other flammable liquids in the early 1960s. In 1964, 3M begin to sell AFFF products used to extinguish fires. Because the fire training activities occurred prior to 1964, Site 22 (APS-02A) – Previous Burn Pits will not be included in the investigation.

Comment #4: Figure 4-1. It will be helpful to reviewers if future documents include watersheds and their context. PFAS compounds can be trapped/bound to organic carbon (in sediments, for example), and may also be highly mobile, traveling great distances in groundwater and surface water. PFAS can migrate in groundwater, including to surface water which may be harmful to food chains and the environment. PFAS can bind to soil, threatening organisms and the environment.

Response: See response to Comment #1.

Comment #5: Table 5-1. Groundwater Pathway. This section describes the PA will include examination of Site releases to the groundwater pathway. This section should also include the discharge of groundwater to surface water pathway. This pathway includes the exposure of ecological receptors to potentially PFAS-contaminated water. Groundwater will discharge and this pathway is potentially complete.

Response: If it is determined that a release occurred during the PA, a thorough assessment of fate and transport will be completed as part of later investigations.

Comment #6: Table 5-1. Surface water Pathway. This section mentions "sensitive environments." According to the document, "sensitive environments" are human-inhabited areas (e.g., residential areas or schools), however, this term also includes ecologically sensitive areas.

Response: The first sentence of the fifth bullet has been updated to state: "Indicate whether sensitive environments (e.g., schools or threatened or endangered species habitats) are present in or adjacent to the surface water migration path (overland and along a 15-mile downstream distance)."

Comment #7: Table 5-1. Soil Exposure and Air Pathways. PFAS binds to soil and may pose a risk to ecological receptors on the Site; this should be included as a consideration.

Response: A second bullet has been added to the Soil Exposure and Air Pathways section which states: "Identify sensitive environments including wetlands, threatened or endangered species habitat, designated wilderness areas, and critical habitat." Note that if a release is suspected during the PA, the site will be carried forward to a Site Investigation. If the release is confirmed in the Site Investigation, additional investigations will be completed which will assess potential exposure pathways to both human and ecological receptors in accordance with the CERCLA process and available PFAS guidance at the time of the investigations.

Comment #8: Site TA-07, New Burn Pit Underground Tank. This Site should be included as part of the investigation. If PFAS contamination has been ruled out, this section should state how that determination was made.

Response: Site TA-07 (New Burn Pit Underground Tank) is discussed in Appendix A. The Site Management Plan stated that fire training activities did not occur at the New Burn Pit. In addition, the footprint of Site TA-07 is located within the boundary of APS-02C, which is being investigated. Therefore, Site TA-07 will be investigated as part of APS-02C.

3M and Fluorochemicals

This website is designed to provide information about a class of compounds generally known as fluorochemicals (FCs) or perfluorochemicals (PFCs) and 3M's involvement with them. Certain chemicals within this group – namely perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) – have generated public interest regarding their potential impacts on the environment and human health. At 3M, we

sometimes refer to these as “legacy” FCs, because we voluntarily announced in May 2000 that we would cease from the manufacture and use of all eight-chain carbon PFCs, often known as C-8s. These compounds are also known as perfluoroalkyl and polyfluoroalkyl substances (PFASs).

3M has not manufactured or used these compounds in approximately a decade. Nonetheless, we realize there is ongoing public interest in these chemistries, and we want to share what we have learned – information and science that confirms our understanding that these chemicals are safe at the levels they are typically found in the environment and in human blood.

Beyond discussion of historical FC chemistries, this site also offers information on new, or replacement, FC chemistries that are used in a variety of current products.

There is a significant amount of information publicly available on the topic of FCs. Although much of it is useful, quite a bit of it is misleading or simply incorrect. The following information is offered as a summary of 3M’s understanding of the science, health and policy matters pertaining to FCs. For readers who seek even more detail, we have included links and references.

This website contains the following sections:

What Are FCs?

3M is a company rooted in scientific exploration. Our research and development has fostered a steady stream of products that have benefitted people worldwide in business, in their homes, and in life for over 100 years. This is evidenced in our development of break-through chemistries and innovative products involving FCs.

It should be noted that FC-related terminology and definitions can be confusing. For the purposes of this communication, we refer to this broad class of compounds as "fluorochemicals" or "FCs." Other commonly used terms include PFCs and "poly- and perfluoroalkyl substances" (PFASs). The reference by Buck, et al, Perfluoroalkyl and Polyfluoroalkyl Substances in the Environment: Terminology, Classification, and Origins, provides detailed and useful information on this topic.

In basic terms, FCs possess either partially or fully-fluorinated chains of carbon atoms with functional end groups. The carbon-fluorine (C-F) bonds are exceptionally strong and stable. The strength of these bonds gives FC compounds chemical and thermal stability. As a result, many of these compounds have been used in surface treatment applications for paper, fabric, cookware, and carpeting. The treatment allows these items to more effectively repel oil, water and stains.

Scientifically speaking, the strength of the carbon-fluorine bond means that these chemicals do not easily degrade in the environment. Through research conducted or sponsored by 3M, certain of these compounds, notably PFOS and PFOA, were discovered worldwide at typically low levels in the environment and in the blood of the general population. In this regard, they join hundreds of other substances that are often detected in our bodies and the environment at trace levels, such as pesticides and other persistent organic chemicals.

3M was a pioneer in the development of FC technologies and products. While the mix of chemicals we use evolves, fluorinated materials continue to be a vital area of discovery for the company. We are not alone in this field. Many other companies across the world have contributed to the past and ongoing development of these chemistries. 3M believes our innovation and unwavering commitment to our sustainability strategy will continue to meet customer needs while ensuring responsible environmental stewardship.

3M's History with FCs

3M's involvement with FCs began in the 1940s. At that time, the company began to collaborate with Pennsylvania State University professor Joseph Simons, who invented a process known as electrochemical fluorination (ECF) to produce fluorocarbons. In 1945, 3M acquired the rights to Simons' process, one which uses electricity to replace hydrogen with fluorine in hydrogen-carbon bonds, thus creating FCs.

3M's researchers soon discovered that the FCs possessed beneficial surfactant properties. (Surfactants are a group of compounds that reduce the surface tension between two liquids or between a liquid and a

solid.) 3M recognized that this class of compounds could offer solutions to the development of a variety of industrial and other advanced materials development challenges.

In celebration of our centennial, the book "A Century of Innovation: The 3M Story," explains that by 1952, as many as 100 people at 3M were working to discover innovative uses of FCs.

In 1953, lab technician Patsy Sherman noticed that a mixture of an experimental FC rubber mixture could not easily be cleaned off of a tennis shoe – it repelled water, soap and other solvents. Her discovery eventually led to the development of the ScotchgardTM brand of fabric and upholstery products, introduced to the market in 1956.

In the early 1960s, 3M researchers met with scientists from the US Naval Research Laboratory about the potential of developing firefighting foams to suppress fires involving aviation fuel and other flammable liquids. During that meeting, it was observed that after 3M's surfactant was mixed with water and applied to a gasoline sample, there was no ignition when a match was lit directly above the gasoline. The research team realized that FCs could be used in firefighting products to prevent, suppress and extinguish fires.

In 1964, 3M begin to sell its "aqueous film-forming foam" (AFFF) products used to extinguish fires. These materials, sold under the brand name Light WaterTM, were so effective at protecting lives and property that they were adopted for use by the United States Department of Defense. 3M's AFFF was also widely utilized by firefighters around the world.

3M's businesses involving FCs continued to grow and diversify from the 1960s through the 1990s – decades that brought the development of many new and useful products.

3M Discontinues the Manufacture and Use of Long-Chain PFCs

3M has conducted medical surveillance of its workers in facilities where FCs were produced since the 1970s. Because, the analytical tools to directly measure perfluorooctanyl in human blood did not exist in the 1970s, 3M set out to develop such tools. Since the 1970s, 3M has led efforts to develop analytical tools to measure minute amounts of FCs in human blood and various environmental media.

In the late 1990s after decades of medical surveillance and measurement development work, samples of blood from the general US population were analyzed as a part of 3M research. It was determined that these samples contained widespread parts-per-billion (ppb) levels of FCs, such as PFOS and PFOA (Hansen et al., 2001). To put these levels in perspective, one part-per-billion is equivalent to one second in 30 years or one penny in $10 million.

Enabled by dramatically improved analytical capabilities, 3M immediately sponsored researchers with access to archived environmental samples (i.e., fish, birds, mammals, etc.) and revealed widespread ppb levels of PFASs in specimens collected throughout the world (Giesy et al., 2001).

Following these discoveries, 3M made the decision to voluntarily discontinue the manufacture and use of long-chain perfluorooctanyl chemistry, including PFOA, PFOS and PFOS-related products. This phase-out action was announced in May 2000 – well ahead of 3M's competitors and before any legislation or regulations requiring such action.

3M quickly executed the phase-out of long-chain perfluorooctanyl chemistry used to produce certain repellants and surfactant products, with most of these activities completed by the end of 2002. Throughout this time, and continuing to this day, the company made the following commitments:

- Continue monitoring of employees' health;
- Advance the scientific understanding of FCs;
- Share research and knowledge with others;
- Work collaboratively with various units of government;
- Reformulate certain affected product lines; and
- Conduct environmental assessments and remediation at 3M locations where these materials were manufactured and/or disposed.

Tracking of Employees' Health

The health and well-being of our workers is a top priority for 3M. Although the voluntary phase-out was successfully completed approximately a decade ago, the company continues to monitor the health of its FC production employees. Numerous studies continue to confirm that occupational exposure to FCs resulted in no negative impact to workers' health (Raleigh et al., 2014, and Olsen et al., 2007).

"We believe that PFOS and PFOA do not present health risks at levels they are typically found in the environment or in human blood," says Carol A. Ley, MD, vice president and corporate medical director, 3M Medical Department. "This view is informed by testing our production workers who were exposed to these chemicals at levels significantly higher than those in the general population – often over an extended period of time. Those workers show no adverse health effects from PFC exposure."

Advancing the Science

3M remains committed to furthering scientific research of these compounds and sharing such information with regulators, scientists, and community stakeholders. These chemicals are some of the most studied in the scientific arena and, to our knowledge, no entity has evaluated them more closely than 3M.

In addition to funding studies at leading global research institutions, 3M has, over the past three decades, conducted and published hundreds of its own studies. As discussed, many of these studies involved the monitoring and evaluation of our employees exposed to these materials.

Recent scientific research continues to confirm the lack of adverse effects in occupationally exposed workers (as well as in the population at large). For example, Chang et al. (2014) performed a critical review of cancer risk based on a comprehensive analysis of available peer-reviewed epidemiological studies, and concluded: "the epidemiologic evidence does not support the hypothesis of a causal association between PFOA or PFOS exposure and cancer in humans."

Subsequently, Chang et al. (2016) performed a critical review of immunological health conditions, also based on numerous epidemiological studies, and found that: "the available evidence is insufficient to conclude that a causal relationship has been established between PFOA or PFOS exposure and any immune condition in humans."

Reformulating Products

3M's phase-out decision impacted many products and several business units. In some instances, through the ingenuity of company scientists, products were reformulated. The redesign of the consumer version of ScotchgardTM fabric protector is a prime example.

On the topic of reformulated chemistries, stakeholders will sometimes refer to a shift from "long-chain" to "short-chain" compounds. Technically speaking, distinctions are typically made between perfluoroalkyl sulfonic acids (PFSAs) and perfluoroalkyl carboxylic acids (PFCAs). In this light, the Organization for Economic Cooperation and Development (OECD) defines "long-chain" as follows:

- PFSAs with six (6) carbons and greater (i.e., with 6 or more perfluorinated carbons); and
- PFCAs with eight (8) carbons and greater (i.e., with 7 or more perfluorinated carbons).

So for example, PFHxS (perfluorohexane sulfonate), PFOS or PFOA would be considered "long-chain," while PFBS (perfluorobutane sulfonate), and PFHxA (perfluorohexanoic acid) would be classified as "short-chain" PFASs.

In general, "long-chain" FCs have garnered more interest in the scientific and regulatory arenas based on the understanding that they tend to be more bioaccumulative than their "short-chain" counterparts.

For 3M, the "long-chain" OECD definition above is consistent with our use of the terms perfluorooctanyl chemistry or "legacy" fluorochemicals and with our announced phase-out of the manufacturing and use of such materials. Beyond PFOS, PFOA and precursor compounds that could break down (e.g., metabolize in a biological tissue) to PFOS and PFOA, 3M also included PFHxS and its precursors in our phase-out decision.

3M has actively promoted the study, development and use of the alternative, or short-chain, PFCs.

These next generation chemicals, such as perfluorobutanesulfonic acid (PFBS), feature shorter carbon chains. These alternative compounds have been evaluated extensively and researched by our company, regulators and others who share an interest in protecting the public.

In our view, short-chain PFCs are safe and effective when used as directed. To our knowledge, there is no peer-reviewed scientific evidence that indicates environmental exposure to these alternative compounds causes any harm to the environment or human health.

In recognition of this, the Minnesota Department of Health (MDH) has developed Health Risk Limits (HRLs), or drinking water criteria, for these alternative compounds, such as PFBS, that are approximately 20 times less restrictive than those developed by the MDH for long-chain compounds, such as PFOS.

Not all 3M products impacted by the "legacy" FC or long-chain perfluorooctanyl chemistry phase-out were reformulated. 3M established a Persistent Chemicals Policy shortly after the phase-out announcement to: 1) minimize the likelihood that manufacture, use and disposal of 3M products will result in the accumulation of persistent chemicals in increasing levels in living

organisms; and 2) to assess and manage the potential for distribution of persistent chemicals in the environment.

This policy resulted in the discontinuation of several product lines around the time of the phase-out, including aqueous film-forming foam “AFFF” and food wrapper products using FCs. To this day, the policy still informs 3M researchers as they develop new products.

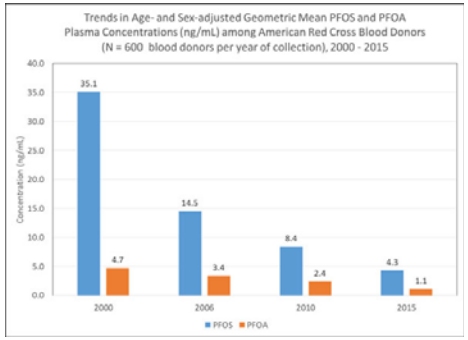
Sharing Knowledge

3M has a long-standing commitment to share its research and data with the scientific community in peer-reviewed scientific journals and with environmental and health officials around the world.

Our scientists and researchers are some of the most widely published experts in the field, and they are often sought out to lead panels or present at international conferences relating to these compounds.

Several recent documents that present the latest scientific insights into these compounds are provided as related links to this website.

Working with the Government



Over the years, and as exemplified by our close interaction with the United States Environmental Protection Agency (US EPA) at the time of our phase-out announcement, we have shared our research and understanding of these compounds with various local, national and international regulatory agencies.

This collaboration has assisted government policy makers, scientists and regulators in their efforts to address FC-related policy and regulatory issues.

We have worked closely with many of the world’s leading regulatory agencies, including the US EPA, the US Department of Defense, Health Canada; health and environmental agencies in Australia, Sweden, Belgium, and Germany; the Department for Environment, Food and Rural Affairs (UK); the European Commission Institute for Reference Materials and Measurements; the US National Institute of Standards and Technology; and several committees of the European Commission and Organization for Economic Cooperation and Development (OECD).

We have also presented scientific study results to regulators at the more local level, such as the Minnesota Department of Health, Minnesota Pollution Control Agency, the Alabama Department of Public Health, Alabama Department of Environmental Management, and the Illinois Environmental Protection Agency, among others.

Assessing and Remediating Sites

Discontinuing the manufacture and use of long-chain FCs clearly resulted in significantly reduced releases of the compounds into the environment.

3M also worked extensively to reduce the environmental presence of these constituents in localized areas where it had FC manufacturing operations.

The company worked closely with various local and national regulatory agencies to perform environmental assessments and conduct environmental remediation activities. To date, 3M has invested more than $100 million in various remediation projects – further contributing to the reduced presence of FCs in the environment.

The EPA's Lifetime Health Advisories for PFOA and PFOS

In 2009, the United States Environmental Protection Agency (EPA) adopted a Provisional Health Advisory (PHA) in drinking water for PFOA and PFOS. The levels were 400 parts per trillion (ppt) for PFOA and 200 ppt for PFOS.

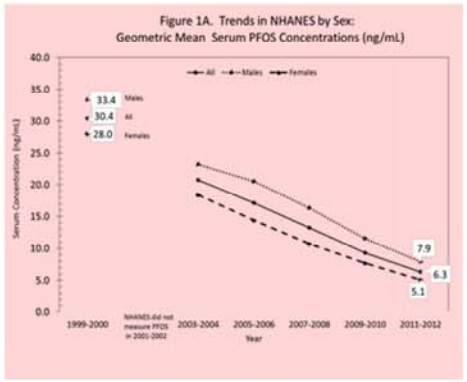
In May 2016, EPA adopted lifetime drinking water health advisories that supersede the PHA. The newly-adopted lifetime drinking water health advisory level for PFOS and PFOA is 70 ppt, individually or combined. The health advisories serve as guidance for determining if concentrations of contaminants in drinking water are safe for public consumption. They provide state and local governments with non-regulatory tools to make decisions where a chemical is not federally regulated. The advisories are for guidance only. They are not enforceable.

The EPA's Unregulated Contaminant Monitoring Rule (UCMR 3) shows that a very small percentage of public water systems (PWSs) for which data is collected have detected concentrations of PFOA or PFOS. PFOS and PFOA have been measured above 70 ppt by approximately 1% and 0.3% of PWSs respectively. Approximately 1% of PWSs have reported data for which combined PFOA and PFOS results are above 70 ppt.

For example, an article in the St. Paul Pioneer Press, "EPA Tightens Rules for 3M-made Pollutants," dated May 22, 2016, reported that in the State of Minnesota, where the environmental presence of FCs has been the subject of much public discussion, the new standards did not mean there was any new risk to public health. "On a scale of hazards, I would rate this as not very high," said Jim Kelly, manager in the Environmental Health Division of the Minnesota Department of Health.

Although we support the work of the EPA and other regulators, we believe these advisory levels are overly conservative. We believe that PFOS and PFOA do not present health risks at levels they are typically found in the environment or in human blood.

Levels of FCs in the Environment and Humans Are Declining



Levels of FCs in the Environment and Humans Are Declining

Reduced exposure to FCs is evidenced in a series of studies that have occurred over the past 15 years involving the measurement of these compounds in the blood of the US general population.

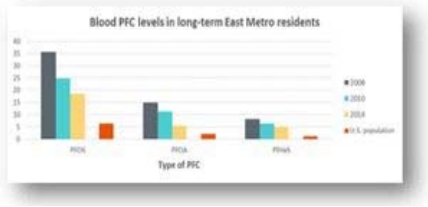
Two different studies have collected and published data in this area – the National Health and Nutrition Examination Survey (NHANES) by the US Centers for Disease Control and Prevention (CDC) and a survey of American Red Cross blood donors.

As the adjacent chart indicates, there is a significant downward trend in the levels of PFOS, PFOA and PFHxS in the US general population in the last 15 years. Based on the NHANES and the American Red Cross data, mean blood levels of PFOS have declined approximately 90 percent since 1999 – 2000.

Similar reductions have been observed in more localized areas where remediation activities have occurred.

For example, in January 2016, the Minnesota Department of Health (MDH) announced the results of a biomonitoring study known as the East Metro PFC3 Biomonitoring Project. “East Metro” is a reference to certain eastern Twin Cities, Minnesota, communities that were evaluated after actions had been taken to reduce the levels of FCs in drinking water supplies. The study found that, since 2008, the levels of PFOS and PFOA in the bloodstream of participating East Metro residents declined by 45 and 59 percent, respectively.

An MDH news release observed that “levels of PFCs in the blood of long-time East Metro residents continue to go down after steps taken in 2006 reduced PFCs in their drinking water...” The study also found that FC levels in newer residents to the area are similar to levels seen elsewhere in the United States.



Still another example of leadership and progress is represented by US EPA’s 2010/2015 PFOA Stewardship Program. Under this initiative, in 2006, EPA invited the eight major fluoropolymer and telomer manufacturers to join in a global stewardship program with two goals: 1) to commit to achieve, no later than 2010, a 95 percent reduction, measured from a year 2000 baseline, in facility emissions to all media of PFOA, precursor chemicals that can break down to PFOA, and related higher homologue chemicals, and product content of these chemicals, and 2) to commit to working toward the elimination of these chemicals from emissions and products by 2015. 3M set the pace in meeting these goals and others in the group have also reported demonstrable progress.

Public Misconceptions About FCs

Although it has been widely reported that there is no causal connection between exposure to PFOS and PFOA and adverse health effects, there is a great deal of misinformation in the public domain.

Animal Studies

For example, over the years, some researchers and media reports have cited the results of animal studies as "proof" that FCs could be harmful to humans. Such reports often fail to mention that rodents (typical test species), to the extent they were affected, were exposed to extremely high doses of the chemicals.

In fact, the very purpose of such animal studies is to escalate the administered dosage of the FC tested under controlled laboratory conditions until an adverse biological response is observed. As such, the levels of exposure to the test specimens was often tens of thousands of times greater than levels typically found in the environment. In the view of 3M and many researchers, these animal studies have not demonstrated that FCs, such as PFOS and PFOA, present any harm to human health.

C-8 Science Panel

In 3M's opinion, another frequently misunderstood and misapplied body of information are the findings of what is known as the "C-8 Science Panel." The C-8 Science Panel was a group of public health scientists commissioned by a state court in West Virginia, in the context of the settlement of a class action lawsuit against another company, to assess whether there is a "probable link" between C-8 (PFOA) exposure and any human disease. The settlement followed a 2002 discovery of C-8 in six water districts near one of that company's manufacturing facilities in West Virginia.

Overall, the C-8 Science Panel's findings support 3M's belief that PFOA does not cause illness in humans. Unfortunately, many media and other reports about FCs cite C-8 Science Panel findings that report "probable links" between exposure to PFOA and adverse health effects. This warrants a deeper understanding of this work and related terminology.

After examining more than 40 illnesses, the panel found no probable links between exposure to PFOA and any of them. It specifically ruled out links between PFOA and a number of health conditions, such as attention deficit disorder, asthma, and learning disorders, among others. For six disease categories, the Science Panel concluded there was a probable link to PFOA exposure: diagnosed high cholesterol, ulcerative colitis, thyroid disease, testicular cancer, kidney cancer, and pregnancy-induced hypertension.

Importantly, a "probable link" is not a "causal link" between exposure and disease. Rather, a "probable link" is merely an association that is "more likely than not" between exposure and a given disease in the cohort being studied (i.e., there is merely a statistical relationship).

3M has carefully reviewed the findings of this panel and, in some instances, has sponsored additional research studies to better inform

the situation. As a result, we believe there may be confounding factors that were not accounted for and in several cases may explain the findings.

Relative to the Science Panel findings, the Minnesota Department of Health (MDH) has stated that the outcomes "are part of a court settlement and not a definitive scientific conclusion."

According to Geary Olsen, Ph.D., 3M Medical Department and Advisory Panel Member to MDH's Environmental Health Tracking and Monitoring program, "Not only does the scientific research indicate that PFOA and PFOS present no harm to human health at typical exposure levels, it also indicates that their levels are steadily declining in the environment and in human blood."

According to Many Experts

Many regulatory agencies, scientists, researchers and other interested parties have responded to public interest in FCs – and the health effects, or lack thereof, associated with their presence in the environment and in human blood.

- As the leading public health institute of the United States, the Centers for Disease Control states clearly, "Finding a measureable amount of PFCs in serum does not imply that the levels of PFCs cause an adverse health effect."
- The Minnesota Pollution Control Agency reports on its website that: "Studies of 3M workers exposed to PFOS and PFOA during manufacturing show no apparent impact on their health."
- According to a Minnesota Department of Health (MDH) report, PFC Risk Assessment, dated May 30, 2007, "There are no specific levels of PFCs in human blood that have been associated with adverse health effects." The MDH has recognized that the mere presence of FCs does not equal harm. As previously noted, human blood levels have continued to drop dramatically since this report was issued.
- In another report issued in January 2013 to the Minnesota State Legislature, the MDH noted that: "Simply finding a chemical in people's bodies does not mean the chemical will harm health."
- An article in the Minneapolis Star-Tribune, "State's lawsuit against 3M over PFCs at crossroads," dated January 13, 2014, reported that in the State of Minnesota, where the environmental presence of FCs continues to generate much public interest, the State admitted that it "cannot identify a single instance where exposure to PFCs in the state's waters proximately caused a health effect in any person."
- In Sweden, where there has been ongoing interest in the presence of FCs in the environment and in human blood, many researchers have repeatedly assured the public there is no health concern. For example, a report authored by Kristina Jakobsson, MD, Ph.D. and associate professor at the Department of Occupational and Environmental Medicine, Lund University, dated June 12, 2014, observed, "The new results [a follow-up health study] do not change the previous risk assessment – there is no risk of urgent negative health effects…"

- In January 2015, the IVL Swedish Environmental Research Institute announced its final report of the RE-PATH project, titled, “Risk and Effects of the dispersion of PFAS on Aquatic, Terrestrial and Human populations in the vicinity of International Airports.” The research project, conducted from 2009-2014, examined the long-term consequences of the use of aqueous film-forming foam (AFFF) at Göteborg Landvetter Airport and Stockholm Arlanda Airport. The report stated, “No risk for human health effects caused by intake of PFOS via water or fish consumption has been identified in the studied areas…”
- In Australia, another area where there has been a great deal of public interest in FCs, the Environmental Health Standing Committee (enHealth) of the Australian Health Protection Principal Committee released guidance statements on perfluorinated chemicals in March 2016. The guidance document states, “In humans, research has not conclusively demonstrated that PFCs are related to specific illnesses, even under conditions of occupational exposure.”
- Professor Jochen Mueller of the National Research Centre for Environmental Toxicology (Entox) at The University of Queensland in Australia testified at an Australian Senate inquiry hearing regarding PFOS and PFOA held on March 9, 2016. According to a transcript of the proceedings, when asked about the medical ramifications of elevated levels, Mueller responded, in part, that, “…from all I know from the literature, I would not expect that this affects my health in any way. I think people being worried about it affects their health more.”
- Furthermore, the Australian Department of Defence stated in a submission to the Australian Senate in December 2015 that, “There are no globally accepted peer reviewed studies showing that exposure to PFOS and PFOA affects human health. Long term, large scale health studies of workers in the USA exposed to high levels of these chemicals do not show chronic health effects.”

Looking Ahead

Fluorinated materials will continue to be important to 3M and its customers. The unique properties related to these compounds allow the development of remarkable products that help 3M achieve its vision: 3M technology advancing every company, 3M products enhancing every home and 3M innovation improving every life.

Our long-standing sustainability principles and, more specifically, our Persistent Chemicals Policy, will continue to guide our decisions in this space.

As new legislation, regulations and/or guidance criteria pertaining to these compounds evolve, 3M will continue to track and, as appropriate, support such measures to ensure that they are based on sound science.

“Decisions relating to the regulation and management of the environmental presence of these chemicals should be based on sound science,” says Jean Bennington Sweeney, Chief Sustainability Officer, 3M Environment, Health, Safety and Sustainability. “The most robust and scientific evidence available indicates the presence of these materials is dramatically declining in the environment.”

Related Information

Standard Test Method for PFOA in articles of commerce

This analytical method is 3M’s recommended approach for low-level PFOA measurement in insoluble solid matrices as part of its response to the REACH Annex XV Restriction proposal for PFOA.